ACTIVITIES 2

Open Innovation to Take on Social Issues around the World

Toward Global Value Creation

In 2015, Hitachi revamped its R&D organization for global promotion of customer-driven R&D. Its Global Center for Social Innovation, of which there are four overseas centers, are the executive organizations for such "collaborative creation with customers." The efforts of the Global Center for Social Innovation toward creating innovation that responds to social issues around the world have begun to show concrete results in various fields, including energy, transportation, healthcare, urban issues, and manufacturing. Regarding responses to these unique social issues, center general managers at each of the four overseas Global Centers for Social Innovation discussed what kind of collaborative creation with customers is being promoted by making full use of Hitachi's R&D strengths.

R&D Bases that are Close to Customers

The series of linear models that manufacturers have used to date for development, commercialization, demonstration, and distribution are no longer valid. Surviving in a global competitive environment requires transition to a business style that incorporates design-oriented thinking and collaboration with customers and partners to quickly provide services that meet market needs. Meanwhile, the corporate sector is also expected to create innovation that responds to social issues, but these social issues vary by global region.

Given these circumstances, Hitachi has revolutionized its research and development (R&D). Specifically, it established overseas centers to position researchers near its customers in 2015, with the aim of incorporating R&D departments that directly create value leading to new business. These are Hitachi's Global Centers for Social Innovation (CSIs: CSI-Tokyo, CSI-Europe, CSI-North America, and CSI-China). In addition to the original CSIs, Hitachi established an Asia-Pacific CSI (CSI-APAC) in 2016, forming a global organization with four overseas CSIs outside Japan (see Figure 1).

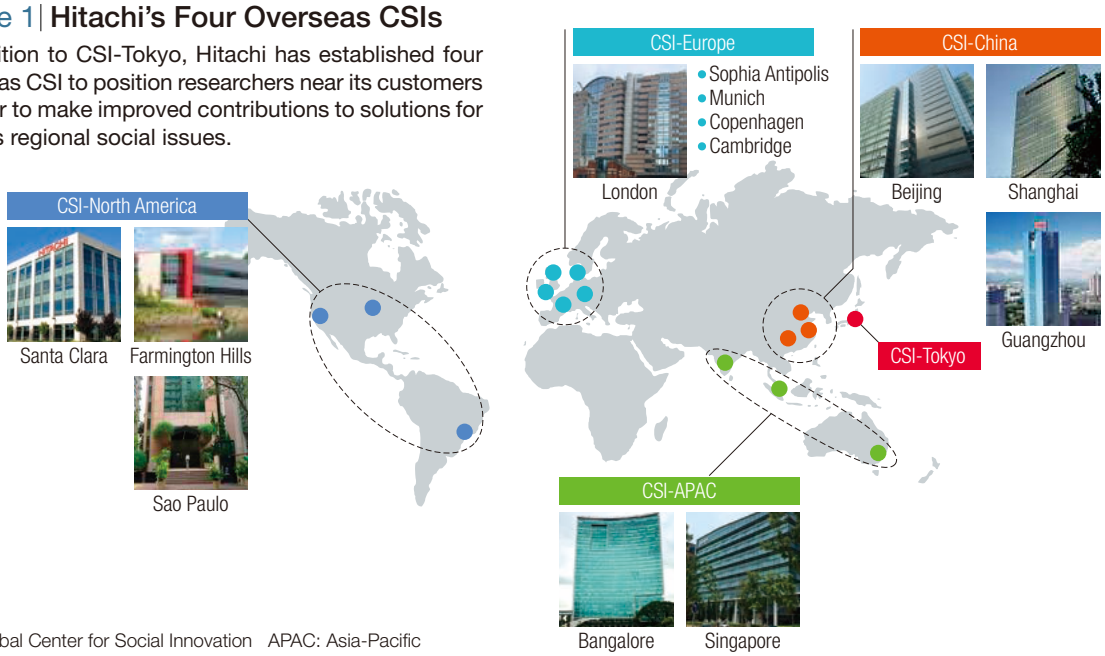
North America is the Forefront of R&D

Regarding the kinds of social issues that Hitachi is trying to solve at its overseas CSIs, and the kinds of achievements that are starting to emerge, George Saikalis (General Manager, CSI-North America) points out that the tasks are quite different from those in Japan.

He notes, "There is a progressing trend where fields such as the transportation and electric power sectors, and the manufacturing industry, are returning to the USA. There is also remarkable progress of the sharing economy in the USA, to the point where even cars are being shared. Sharing-economy companies are pushing for the development of autonomous vehicles, and competition in the development of autonomous driving

Figure 1| **Hitachi's Four Overseas CSIs**

In addition to CSI-Tokyo, Hitachi has established four overseas CSI to position researchers near its customers in order to make improved contributions to solutions for various regional social issues.



CSI: Global Center for Social Innovation APAC: Asia-Pacific

technologies is currently in overdrive in Silicon Valley and Detroit. We are now working with business divisions in the USA to develop the systems necessary for autonomous vehicles. The point here is that we consider the construction of reliable autonomous driving systems to be more important than the level of autonomous driving itself, and to that end we plan to include artificial intelligence (AI) and prediction technologies."

Hitachi is advancing the development of advanced driving assistance systems and supporting components such as controllers and stereo cameras, and has already constructed experimental vehicles. At CES 2017, the largest consumer electronics fair in the USA, Hitachi demonstrated a remote parking system that uses smartphones. It is also promoting the development of autonomous driving systems through its involvement in the University of Michigan's Mcity* experimental project, for example, by starting operational tests for urban areas (see Figure 2).

Natural energy is rapidly expanding in the electric power field, where aging infrastructure necessitates the urgent construction of a new power grid. Under these circumstances, micro-grids have been

*Mcity is a trademark of Regents of the University of Michigan.

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General Manager,
Global Center for Social Innovation – North America,
Research & Development Group

Global Center for Social Innovation – North America (CSI-North America)

CSI-North America has bases in Santa Clara, California, USA; Farmington Hills, Michigan, USA; and Sao Paulo, Federative Republic of Brazil. In 2016, this CSI opened its Financial Innovation Laboratory and its Digital Solution Platform Laboratory to strengthen research of IoT platforms. CSI-North America is building a foundation for big data analysis and is working on collaborative creation toward solutions in fields such as energy, communication, finance, and healthcare.

attracting attention in the USA from the perspective of disaster resilience. Hitachi plans to utilize the results and expertise resulting from smart grid demonstration projects conducted in New Mexico and at other sites in the USA. Hitachi is currently developing energy solutions that utilize its Internet of Things (IoT) platform Lumada and is also creating opportunities for collaborative creation with customers by exhibiting at DistribuTECH, one of the largest energy-related events in North America.

He says, "In addition to infrastructure maintenance, thanks to our base in Silicon Valley—an advanced area for IoT solutions—we believe that we have a leading R&D role to play, such as realization of innovative digital solutions. We are working on solution cores (solution templates) in the energy field resulting from use of Lumada, for example, by applying it to solving issues in factories, with a view to expanding application to other fields.

CSI-North America connects research and business in the form of providing IoT, analysis, and other technologies, and is now building various solutions utilizing Pentaho and the like in combination with Lumada. CSI-North America is accelerating the development of solutions to respond to the further sophistication of production systems required as a result of the manufacturing industry returning to the USA.

China is Transitioning toward "Quality Growth"

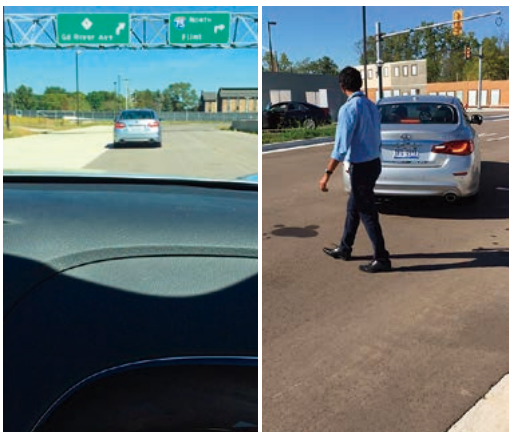
China has entered a period of stable growth called the "new normal," and its 13th Five-Year Plan, which took effect in 2016, promotes various measures as government initiatives.

As Chen Yang Qiu (General Manager, CSI-China) states, "This is an era of transition from quantity growth to quality growth, and measures being undertaken are aimed at improving quality to accommodate Chinese social issues. There are many issues that need to be addressed, such as strengthening our manufacturing industry—where there is still much room for growth as compared with developed countries—and, in the consumer field, there are medical issues and challenges that have accompanied China's rapid urbanization. We regard these as business opportunities and hope to contribute to quality improvements in all fields, particularly IT solutions."

In the medical field, the Chinese government is trying to improve the quality and quantity of healthcare services through its "Healthy China 2030" initiative. However, all hospital-related issues must consider the current situation; patients are concentrated in large hospitals, making consultations slow, while the small to medium-sized hospitals that should be performing primary care tasks have far fewer patients from the viewpoint of medical services. This small number of patients

Figure 2| **Mcity Experiment**

Hitachi is participating in experimental automobile and connected car projects being carried out at the Mcity facility, located at the Ann Arbor campus of the University of Michigan. It is accelerating the development of autonomous driving technologies by running tests using advanced driving support systems.



leads to the negative feedback loop of slow investment. In response to these challenges, Hitachi is using hospital operation support solutions such as positron emission tomography examination centers to reduce the initial investment of hospitals, aiming at contributing to the healthcare field while working to improve the quality of medical services such as those provided at testing centers.

A national initiative called "Made in China 2025" addresses the task of raising the level of China's manufacturing industry. The focus is on innovation and the development of a recycling-oriented society, with strategic targets such as smart manufacturing to make production more efficient, and green manufacturing to reduce the environmental burden. Hitachi is promoting smart logistics efforts aimed at reducing procurement logistics costs by utilizing joint delivery and "milk runs," which are round trips that facilitate efficient distribution or collection.

In the manufacturing field, in 2015, Hitachi held technology exchange meetings in coordination with Chinese governmental agencies (see Figure 3) and established a collaborative agreement related to technology innovation for smart manufacturing and green manufacturing.

Hitachi is pioneering advanced solutions to solve the various issues that arise alongside urbanization.

As she says, "For example, in response to the need to alleviate congestion in urban traffic, we offer solutions using cameras to visualize congestion levels in buses. For customers who manage urban public spaces, we also offer security solutions using camera-acquired images. Through such proposals to our existing customers, we can expand our Social Innovation Business while also working to develop new customers. While cooperating with relevant business divisions in each of these fields, CSI-China is developing collaborative creation with customers and is promoting the development of advanced technology and solutions."

Figure 3 **Technical Exchange Meeting as Part of "Made in China 2025"**

This event for the promotion of inter-government and inter-company exchange and cooperation was held in Beijing in coordination with the China Electronics Chamber of Commerce, which is affiliated with the Ministry of Industry and Information Technology of the People's Republic of China. Executives from local Hitachi affiliates attended, and introduced technologies, solutions, and examples contributing to the realization of "green manufacturing" and "smart manufacturing."

Global Center for Social Innovation – China (CSI-China)

In addition to bases in Beijing and Shanghai, in 2016 Hitachi established a base in Guangzhou, the central city of the manufacturing aggregation site called the Pearl River Delta region. CSI-China actively promotes cooperation between Chinese industry, government, and academia. It is working to develop digital solutions in China, where services such as smartphone applications for electronic payments, taxi dispatch, and bicycle sharing are rapidly developing.

Chen Yang Qiu
General Manager,
Global Center for Social Innovation – China, Research & Development Group

Europe Faces the Challenges of a Mature Society

Many European social issues cannot be addressed without considering the maturity of the society there. An increase in lifestyle diseases such as diabetes is but one unique challenge for a mature society. At CSI-Europe, Hitachi is concentrating on collaborative creation for solutions in the energy and healthcare fields, with a focus on solving the issues of such mature societies.

As pointed out by Kazuyoshi Torii (General Manager, CSI-Europe), "In Europe, where environmental consciousness is high, each country, city, and company is motivated to reduce CO_2 emissions. When doing this, however, it is insufficient to merely increase energy efficiency. It is also important to reduce CO_2 with as little investment as possible, such as through equipment replacements that retain the good aspects of previous systems. The technology for realizing this is not easy, but we hope to show results in that area."

From his comments, it can be seen that in addition to technological developments themselves, there is a need for multilateral studies of, for example, effectiveness and economy. Hitachi is pursuing efforts to overcome challenges in the energy field through various demonstration projects. One example is a smart community demonstration project, which began in April 2014 in Greater Manchester, UK. The purpose of this project is to promote an energy shift from gas to electricity through heat-pump technologies and information and communication technology, and to demonstrate technologies and systems that contribute to the realization of a low-carbon society. In March 2017, a smart-grid demonstration project for expanding the introduction of renewable energy began in the Republic of Poland.

In the healthcare field, a demonstration project on diabetes prevention is in progress in the Manchester, UK area. This project is jointly conducted by Hitachi and the Salford Royal NHS Foundation Trust, an advanced model hospital in the UK. Conventional telephone-based programs for guidance on lifestyle improvement are limited in terms of effectiveness and the scale of persons accommodated, so this program is characterized by its application of IT to lifestyle improvement programs. This is expected to be a solution toward curbing increases in medical expenses accompanying aging (see Figure 4).

He says, "For nearly 30 years we have been involved not only in projects at the national level, but also in projects jointly promoting R&D activities with companies, universities, and research institutions, and that experience is greatly aiding us now. Being entrusted with social infrastructure projects in Europe requires first being recognized

Global Center for Social Innovation – Europe (CSI-Europe)

CSI-Europe has extensive bases in Europe, including London and Cambridge in the UK, Sofia Antipolis in France, Munich in Germany, and Copenhagen in Denmark. Hitachi is participating in market creation activities in Europe, which is strong against standardization, and are working along with major companies on realizing solutions that solve the issues of a mature society.

Kazuyoshi Torii
General Manager,
Global Center for Social Innovation – Europe, Research & Development Group

Figure 4| **A Lifestyle Disease Prevention Program in Manchester, UK**

This photograph shows verification of a system prototype. Cases like this utilize the expertise in lifestyle counseling and advice that the Hitachi Health Insurance Society has acquired in Japan.

as a member of the group. This is an opportunity for initiating collaborative creation with customers."

He also describes the state of R&D in Europe: "Since Europe is made up of many countries with long histories, there are incompatibilities if everyone isn't using the same technology. For this reason, Europe is also keen to jointly develop new technologies that will become global standards. For example, V2X [vehicle-to-everything] technologies are key to achieving autonomous driving, and by making Hitachi's expertise in IT×OT [operational technology] a global standard, we hope to contribute to business and society."

Multifaceted Issues in Asia

Established in April 2016, the CSI-APAC aims to promote collaborative creation such as smart cities that incorporate growth in Asia. Yasushi Harada (General Manager, CSI-APAC) explains how the quality of social issues greatly differs by country and region: "In India, where urbanization is proceeding with tremendous momentum, the social infrastructure is not well developed. In 2012, a large blackout occurred that affected more than 600 million people, and it is said that more than 30% of tap water is lost before it reaches end-use factories and families. We hope to solve such fundamental social issues through our technology."

Even so, the promotion of the Social Innovation Business in India, including projects for electricity, water supply, and railways, has only just begun. He describes his ambitions for "advancement while working for understanding of Hitachi technologies," such as through efforts in the transportation field to reduce the risk of traffic accidents by finding unevenness in roads using cameras.

In contrast, in Singapore, which is known as a rich urban state, there are issues regarding whether to maintain current levels or to grow further. One such issue is urban crime prevention through advanced security measures. Because Singapore

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Global Center for Social Innovation – APAC (CSI-APAC)

Based in India (Bangalore) and Singapore. In India, CSI-APAC develops basic technologies for software reliability, Information technology (IT) solutions through application of data science, and system control technologies for social infrastructure making full use of abundant engineering resources of the country. In Singapore, CSI-APAC is working on developing advanced solutions applying big data analysis and artificial intelligence. In addition, R&D staff have been newly stationed in Australia.

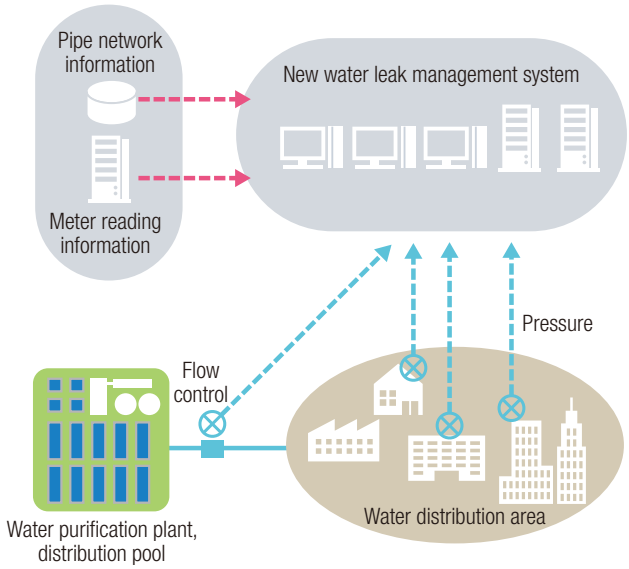
is an island nation, it is also necessary to reduce energy consumption and to establish a stable water supply system.

He says, "Singapore is a country that is very open to innovation, and the government calls on the nation to become a test site for urban technologies aimed at coping with healthcare, transportation, and aging issues. We are proceeding with a number of demonstration experiments that take advantage of this privileged environment, and we are beginning to develop results in other areas as well."

One example is demonstration of a leak management solution in a Southeast Asian water distribution district (see Figure 5). The system is a solution to a social issue found in Asian countries, namely, leakage due to cracks in water pipes. From confirming the effect of leakage estimations, deployment to other countries with the same issue is ongoing. There will likely be a heightened need for global partnerships that incorporate such results from other places and other centers.

Figure 5| Water Leak Management System Used in a Demonstration in Singapore

Based on an original Hitachi simulation analysis, the distribution area is virtually divided into multiple small areas, and small areas with a large amount of water leakage are estimated. Hitachi is contributing to improving the efficiency of water leakage management by water utilities and to increasing water utility profits.



Expanding Open Innovation with Lumada

The general managers at each overseas CSI facility were asked what they think about future developments and directions.

Saikalis: I would like to contribute to platform development of our solutions business. To grow business in North America, we will use Lumada to surely take on the challenge of developing solution cores.

Chen: Fields like manufacturing, urban issues, and healthcare are unchanged, but we would like to use local strengths to fortify cores with Chinese characteristics. I would also like to globally develop the results from this in a China-based Lumada.

Torii: Participation in global standardization activities as well as ideas from R&D and the value created form the starting point for new business. We are aiming at creating new businesses to follow up on our railway successes in the UK, which were the result of hard work by those who came before us.

Harada: We are currently at the stage of making Japanese technology usable in India, but our goal is to make something that can only be done in India. We want to produce things unique to India, such as software and analysis technologies, and promote them.

It is significant that each CSI is working on initiatives under different conditions. Technologies and solutions developed at one center accelerate global collaboration leading to their further development at the other centers. In that respect, for Hitachi, which is promoting its Social Innovation Business using digital technology, the Lumada IoT platform will surely be effective as a foundation for application development. When facing the social issues of both today and tomorrow, Hitachi's four overseas CSIs will continue to lead open innovation.